

# Revitalized Screen Reader for Visually Challenged

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## Abstract

In the world at present there are numerous instruments and devices that show different facilities and characteristics for the improvement in the communication skills of individuals with visual impairments. For the presentation of texts for the person with a visual impairment, many of the devices are used to replicate the traditional braille display where each character is defined by six points that may be shifted vertically in upper or lower directions mechanically or electronically, or through any other process. The report includes an overview of current instruments and strategies to develop blind people's communication. The study also recommends a complete system that integrates problems with systems and solutions into the Refreshable Braille Reader concept. The system proposed is an affordable Braille reader that increases the literacy rate for braille. The summary report also includes the suggested block diagram, a number of hardware components such as solenoid, cam, motor etc. and the Raspbian stretch lite software tool this system provides various applications and benefits in the lives of visually impaired people with different communication challenges. Six characters can be formed concurrently. And it is analyzed for upper, lower, mixed and the generate outputs

## Article History

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## I. INTRODUCTION

The “Refreshable Braille Reader for The Visually Impaired” may be a device to help the unsighted individuals with complete or partial vision defect to scan. The system takes the document and gift it to the reader in braille format. Braille may be a tactile technique of reading that uses Associate in Nursing array of vi dots organized in 3 rows and 2 columns. This technique uses the decorated dot to recognize the letter, numbers, punctuation or pattern. The six dot of braille script are often organized in sixty-three totally different mixtures from no dots decorated to any or all the dots decorated. every pattern of dots is mapped to bound letter of any specific language or numbers. Braille is scanned with the eye or head going from one line to the next. In the reading process, each hand is normally concerned and read is usually done with index fingers. The normal read speed is around a hundred

25 words / minute, but greater speeds of up to 200 words / minute are possible. By exploitation the braille alphabet, those that are blind will review and study the word. they'll additionally become conscious of totally different written conventions like orthography, punctuation, paragraphing and footnotes. The braille scripts are often of an alphabetical braille (Grade I) wherever the word is diagrammatical exploitation all letters of that word or literary or narrowed braille (Grade II) that uses shorthand to represent the full word. An electric-mechanical nursing device for display of braille characters is a refreshing braille or braille terminal. Usually, it is made from rounded pins that are raised through holes on a very flat surface. Typically, a mechanism that makes use of piezo-electric material is employed to maneuver the pins up and down. This project acts as a refreshable braille reader screen creating use of linear

Actuators providing the visually handicapped person an

{Opportunity} to teach oneself and so offers him a good sort of opportunity to find out, work together with his/her daily activities.

## II. OBJECTIVE

In a world of seven.6 billion folks nearly 285 million folk's area unit visually impaired and nearly thirty-nine million folks area unit fully blind. Out of that ninetieth area unit unable to scan, our project could be a effort to assist the visually impaired folks. the most objective of this project is to

- it's going to increase the braille attainment rate
- To implement linear actuators in refreshable braille readers
- Give Braille reading device that is wise, compact and price effective

Hence our project makes it doable for visually impaired folks to urge educated and will increase the possibility of their employability.

## III. PROBLEM WITH EXISTING SYSTEM

Present braille readers use Shape Memory Alloys (SMA) which is very complicated to fabricate which increases the production cost of the system which is burden to the customer. If the system gets broke it is nearly impossible to repair it and has to be replaced by a new one. They cannot cope up with the wear and tear due to daily use. The only other technology used makes use of piezo-electric material which makes the displays expensive.

All the braille reader till now lacks memory which makes it dependent on computer laptop or some other devices. Hence it will be useless without other devices and effects its portability.

## IV. PROBLEM SOLUTION

The new braille reader uses simple and yet efficient solenoid actuators which is low priced, thus it

reduces the price of whole system. Our device consists of small amount memory which makes independent.

## V. DIFFERENT TYPES OF READER TECHNOLOGY

### A. Hardware Devices Used For Disabled Persons

Braille technology is thus able to revolutionize the lives of thousands of people by allowing them to communicate with their eyes in the virtual world. Braille technology allows blind and visually impaired people to try common tasks, such as writing, browsing the net, BRAILLE writing, writing in text, chatting, downloading, Art, electronic media maltreatment, art destruction and documents processing. It also requires blind or visually impaired students to complete all classroom courses because the majority of the knowledgeable classmates and encourages them to take online classes. It encourages professional to attempt to teach malware and computer code applications to their employers and lecturers [XCI07]. When blind people access to a large number of books and libraries, the advances in braille technology are significant and also improve the printing of Braille texts. Standard Braille Teaching tools [KAA02] are later used.

### B. BRAILLE TYPEWRITER

Braille's system of characters was developed by the Frenchman Louis Braille for blind people when he read or write in 1821, so that Braille is adapted to almost any known language, using the worldwide community of visually impaired people. Braille character consists of 6-8 dot positions which formed in a rectangular shape containing two columns of three dots each, or  $3 \times 2$  dots as shown in Figure

1. At any of the six positions, dots will be raised on the flat surface to excite the fingertip in order to interpreted and described in text form and methods of transferring a desired pattern of Braille onto

planar surface [MD01], [MM01]. It is few metal structures, with cheaper price and straightforward operation has ensured that it's remained the foremost widespread amongst the visually impaired. It's an easy machine want to write Braille symbols. It's like a serial printer, with a key like every of the six dots of the Braille code. The Perkins Brailler could be a "Braille typewriter" as mentioned in Figure 1. A couple of 1 contains six points of braille code, a zone key, a backspacer and a kind of serial manual printer, 2 aspect knobs for press-advanced paper and a printer operation lever higher than a keyboard. The rollers holding and moving the paper have grooves that prevent the raised dots formed by the brailer from being moved [ PAP13].



**Fig 1: Braille Typewriter**

**C. Hand Held BrailleWriter**

Low cost Braille writer for blind people was designed by the Johns Hopkins University, USA. It is a lightweight,portable Braille writing device that requires no electronic components. This is used to make up to six Braille positions in each cell of a Braille Slate as shown figure2.



**FIG 2: BRAILLE WRITER**

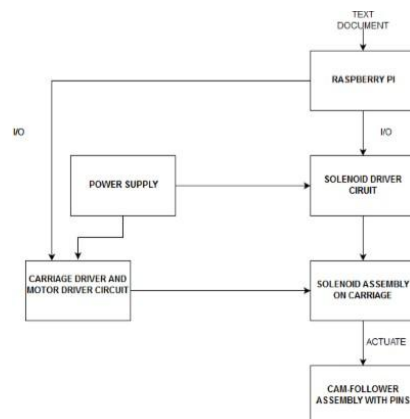
**D. BRAILLEKEYBOARD**

Braille keyboard was introduced in 2001, the Alva 570 Satellite professional is that the 1st desktop model keyboard. it's designed specifically to be used at intervals a graphical interface that offers users the advantage of a good Braille line, however in a sublime and technology profile. It produces a straightforward access machine for blind individuals, the perform keys is outlined as speaking, printing, translating, embossing etc. so the direction keys are used as shift, control, capital lock and back area. The disadvantage of this keyboard is overlap. once one or 2 keys are ironed, the keyboard will work well. However, if keys to be ironed are quite 2, overlaps might happen [LWS04]. Its shown in the figure 3

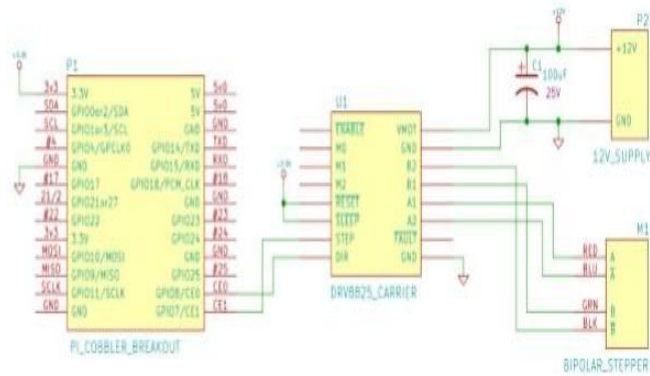


**FIG 3: BRAILLE KEYBOARD**

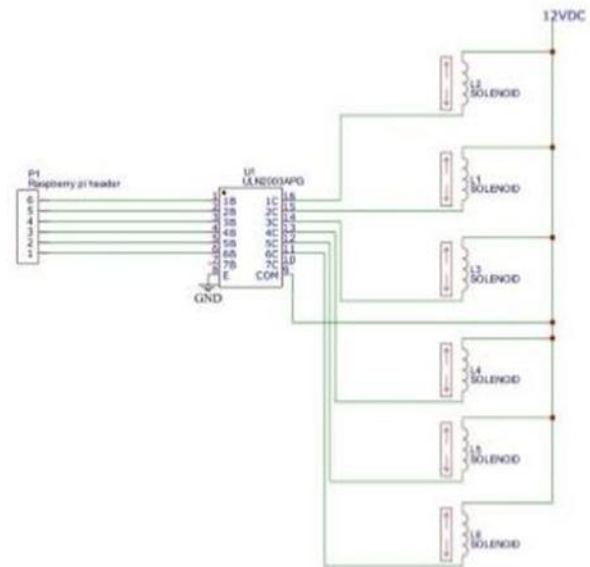
**VI. ARCHITECTURE OF BRAILLEREADER**



**Fig 4: block diagram**



**Fig 5: motor wiring**



**FIG 6: SOLENOID DRIVER CIRCUIT USING ULN2003A**

The motor accustomed give the linear motion is NEMA17 bipolar stepper motor. The motor incorporates a holding force of four.2 KgCm. This live of strength means that the stationary motor will hold a weight of four.2 kilogram on a 1cm radius block. Holding force assumes the motor isn't turning. Themotorisbi-polarandthenceit'sfourwires(2for every coil). For bipolar stepper motors current has to alternate directions across the coils to vary the magnetic poles. This dynamic polarity needs aa lot of complicated driving circuit. DRV8825 is employed to perform the task of alternating this across thecoils.

DRV8825willbeaccustomedmanagementthestepper motor through straightforward DIR and STEP interface. once the DIR is high (0) the driving force drives the motor in dextrorotary direction and by default the DIR is pulled-down so by default the driving force drives the motor in anti-clockwise direction. A HIGH at the STEP pinrepresents a step and moves the motor by one step i.e 1.8degrees.

A single Darlington try consists of 2 bipolar transistors andit operates on the present vary of 500mA to 600mA. Its pin configurationismeantsotheinputpinssquaremeasureat the left aspect of the IC whereas the output pins of it square measureonrightaspectaheadofthecorrespondinginput pin.

**VII. WORKINGOPERATION**

The total working of the Refreshable Braille Reader can be explained in two sections one describing the hardware parts which involves electronic circuits and mechanical componentsandtheirfunctionsandthesecondpartinvolving softwareprocessing

**A. SOFTWAREOPERATION**

Once the script is run the user is asked the name of the document to be displayed, as the user enters the name of the document the document is opened in suitable format. The brailer() function is called with the word to be displayedand the previous word as arguments. The previous word is required to refresh the cell before the word is displayed. The formater() function performs the task of formatting the previous word to suitable format if the length of the word exceeds 6. The brailer() obtains the words and

converts to braille pattern one letter at a time. It generates a list of binary strings that represents the braille pattern corresponding to each letter. Each element of the list is used to call the printer () function which actuates the solenoids in the pattern corresponding to the binary strings. After each letter is displayed the move () function is called with suitable arguments to move the carriage from one cell to the next. Once letter count exceeds 6 the move () function is called again to reset the carriage position. Once a word is displayed the system waits for the user to either push the next button or displaying the next word in the text or the previous button or displaying the previous word. Thus, the system provides a feature of user to read in his/her own frequency.

## B. HARDWARE OPERATION

The hardware part consists of a linear guide and solenoid carriage assembly, stepper motor, motor driver module, switching circuit, control switch, and cam follower assembly. The six-digit binary output produced from the raspberry pi by converting an alphabet/number/punctuation is provided to the switching circuit (ULN2003A) which actuate the corresponding 6 solenoids based on the state of input from controller. The actuated solenoid pushes the cam follower which in turn latches the pin. The pattern produced by these pins form a letter. Here the pins will be latched and doesn't retract unless it is reset by the solenoid. After one letter is formed based on the controller produced output the driver controller module provides a signal to the stepper motor which precisely moves the carriage to the next cell with the help of timing belt. here again based on the controller output another letter is formed. This process is repeated for all the six cells which forms a word. After forming a word, the controller waits for user to press either the forward or backward control switch. Based on user input the controller resets the current letter by actuating the same solenoid which were used to set that letter

followed by which it actuates the solenoids so as to produce corresponding letter of next word. Thus, it efficiently resets the current word and forms next word.

## VIII. METHODOLOGY

STAGE 1: supported existing survey a summary is drawn concerning the population of dim-sighted individuals and also the population willing to be told and skim books. A conclusion is drawn from the survey concerning the population which will be helped by the project.

STAGE 2: Study is formed concerning the prevailing technologies and their limitations. associate degree objective is formed to create the project value effective.

STAGE 3: a call is formed to use linear actuators (solenoids) to maneuver the pins up and down. the price began to lift with the quantity of cells.

STAGE 4: a call is formed to use belt drive to produce linear motion to the coil assembly and scale back the quantity of solenoids.

STAGE 5: A cam-follower assembly is employed to latch the motion of the pins. The holder for the cam-follower assembly is meant. the scale of every cell is finalized.

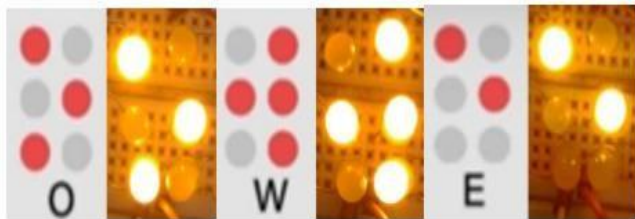
STAGE 6: The cam-follower style and a spring with needed spring constant is employed to produce linear motion to the cam plunger.

STAGE 7: Metal plates is holder for the cam-follower assembly. this can additional scale back the price. A CAD drawing of the cam-follower holder is given for laser-cutting. The assembly for the cam-follower holder is formed exploitation the plates and also the cam-follower assembly to get a epitome and also the assembly is confirmed to figure.



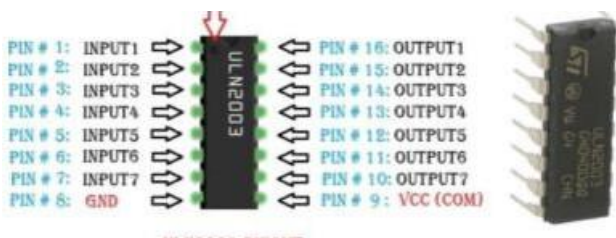
**FIG 7: CAM FOLLOWER ASSEMBLY AND HOLDER**

STAGE 8: it's set to use raspberry pi model one for management of the shift circuit. Six GPIO pins are accustomed management the transistors within the shift circuit. Python3 is chosen to program the GPIO and RPi. GPIO library is employed to access the GPIO pins of the raspberry pi. A script is written to browse a .txt file and convert it to braille pattern. The braille pattern is employed to work out the logic signals to be sent to the shift circuit that additionally controls the coil propulsion. The script so reads every word from the document and sends logic signals to the shift circuit similar to every letter of the word.



**FIG 8: BRAILLE PATTERN CORRESPONDING TO EACH LETTER**

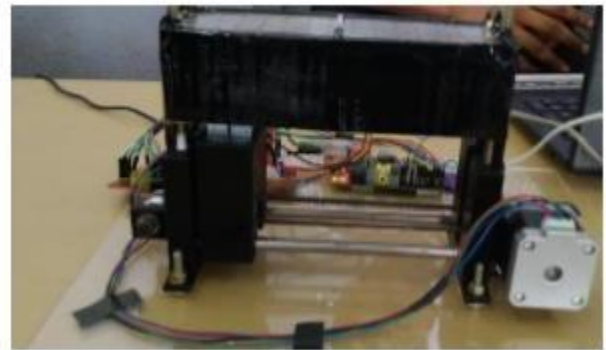
STAGE 9: ULN2003A Darlington transistors array IC is employed to drive the solenoids in line with the logic signals obtained from the raspberry pi with 12VDC.



**FIG 9: ULN2003A PINOUT**

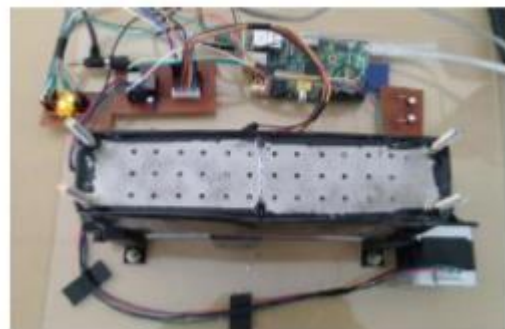
Stage 10: Final assembly for linear motion was completed and also the operating of linear motion and coil propulsion was confirmed.

Stage 11: Cam follower assembly beside the cam holding plates was assembled and its operating was discovered.



**FIG 10: CAM ASSEMBLY**

Stage 12: Final assembly was created and its output for various cases were verified



**FIG 10: FINAL ASSEMBLY**

## IX. RESULTS AND DISCUSSION

The working model of Refreshable braille reader is built and tested its working for all the cases possible.

Case 1: upper case alphabets Input given: HELLO  
Output produced:



Case 2: lower case alphabet Input given: hello

Output produced:

Case 3: Mixed case alphabet Input given: CaRd



Output produced:



Case 4: words containing six letters Input given:  
wonder

Output produced:

Case 5: words containing less than six letters

Input given: Jar Output produced:



Case 6: words containing more than six letters input  
given: puzzling

output produced:



## X. CONCLUSION

The main aim of this project is to provide the support for visually impaired people with a portable and completely low-cost system. The device contains a cheap Braille reader that enables people with an impairment in their vision to conveniently read any text in Braille. This study has led us to think and to present an idea that can contribute to the development of a cheap, refreshing braille reader and to the applications it offers to communicate with survivors who are blind, blind or non-disabled.

## XI. FUTURE SCOPE

1. It can be made wireless
2. The device can be made smart and can be incorporated with voice assistance
3. Increase the number of cells in each rows
4. Increase the number of rows
5. Provide internet connectivity
6. Provide mechanism to indicate pictures

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